Influence of the dry matter content of grass on the silage acidification using inoculants

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Introduction The acidification of the ensiled material is a key factor to eliminate the proliferation of undesirable microorganisms (Clostridia, Listeria, E. coli, etc.) and to stop the enzyme activity in the plant diminishing the respiration losses. The aim of the trial was to compare the influence of different DM contents on the pH lowering in grass silage using inoculants or not.

Material and Methods Timothy grass with different DM contents (15, 30 and 50%) was ensiled under laboratory conditions and inoculated as shown in Table 1.

Table 1 Products used for the trial and their characteristics

Product	Type of lactic acid bacteria		Concentration (cfu/g)	
	homo-fermentative	hetero-fermentative	in the product (laboratory analysis)	in the silage (calculated)
A	X	-	$1.4x10^{11}$	$1.4x10^{6}$
A50%	X	-	$7.0x10^{10}$	$7.0x10^{5}$
B	X	-	$2.4x10^{10}$	$2.4x10^{5}$
C	X	-	$8.6x10^{9}$	$8.6x10^{3}$
D	X	X	$1.2x10^{10}$	$6.0x10^{4}$
F	X	-	$1.0x10^{11}$	$3.0x10^{5}$

Results and Discussion As shown in Figure 1, the products A in a normal or half dosage, as well as product F, decreased the pH value already after 1 day of fermentation, independently of the DM content. Product B reached values very close to the products A and F. All those products decreased the pH value after 3 days to below 4, a desirable pH in order to stop the growth of, for example, Clostridia, which can markedly decrease the silage quality due to protein breakdown and production of butyric acid, making the silage less palatable for the animals, and diminishing this way the silage intake. The acidification using product D was slower and more influenced by the DM content, meaning the higher the DM content, the slower the pH decrease.

The acidification of grass silage using product C or no silage inoculant (Control treatment, CT) was similar: silages with 15 and 30% of DM decreased their pH value slowly, and with 50% was practically no acidification. The performance of product C could be related to the low inclusion rate ($8.6x10^{3}$ cfu/g of silage) (Kung *et al.*, 2003). The retarded growth of lactic acid bacteria in silage with relatively high DM content is related to the higher osmolality of the plant fluids. In general, the inclusion of silage inoculants speeded out the fermentation and deepened the acidification. The growth of lactic acid bacteria showed a polynomial function with high coefficient of positive correlation (R^2=0.72). The maximal growth was reached with an approximated pH value of 4, showing the ability of lactic acid bacteria to decrease the pH value

due to their lactic acid production and survive under relatively high medium acidity. Correlations between growth of lactic acid bacteria after 7 days of fermentation and the acidification on the grass silage were calculated but were very low due to the high dispersion of the values. Nevertheless it is possible to see tendencies which could be summarized as follow: a) the higher the DM content, the higher the pH values over the whole period; and b) the maximal growth of lactic bacteria is presented when the DM content was approx. 30%.

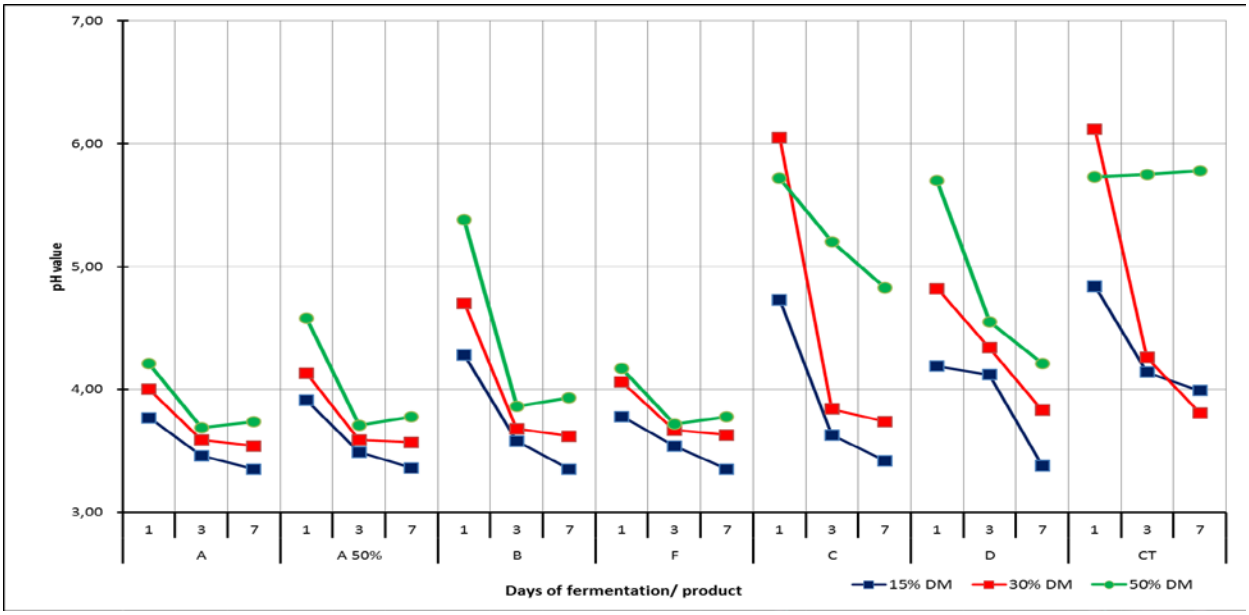

Figure 1 Influence of different inoculants on the pH value after 1, 3 and 7 days and different dry matter content (15, 30 and 50%).

Conclusions

It can be concluded that the inclusion of silage inoculants allows to acidify the substrate markedly, especially in silages with relatively high DM content, the composition and the inoculation rate of each silage inoculant plays a decisive role on the final results, lactic acid bacteria can decrease the pH to relatively low values and their maximal growth was shown to be around 4, and the best acidification in grass silages was reached when the DM content was approx. 30%.

References

Kung Jr., L., M. R. Stokes and C. J. Lin. 2003. Silage Science and Technology (Am. Society of Agronomy, Crop Sci. Society and Soil Science Society of America. ISBN: 978-0-89118-234-4